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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/839,596	04/20/2001	Giuseppe Croce	99AG39853288	1496

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EXAMINER
NADAV, ORI

ART UNIT	PAPER NUMBER
2811	

DATE MAILED: 08/21/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/839,596	Applicant(s) CROCE ET AL.	
	Examiner ori nadav	Art Unit 2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 June 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *5-25* is/are pending in the application.

4a) Of the above claim(s) *19-25* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *5-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *5* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

1. The preliminary amendment filed on 04/20/2001 has been entered.

Election/Restriction

2. Applicant's election with traverse of Group I, claims 5-18 in Paper No. 9 is acknowledged. The traversal is on the ground(s) that search and examination of the entire application can be made without serious burden. This is not found persuasive because, as cited in the restriction requirement set forth in the Office Action paper no. 8, the search is not coextensive as evidenced by the different fields of search for the process and product, thus creating serious burden on the examiner. Furthermore, search and examination of two separate and distinct inventions can not be made without creating serious burden on the examiner.

The requirement is still deemed proper and is therefore made FINAL.

Oath/Declaration

3. The oath/declaration filed on 04/20/2001 is acceptable.

Drawings

4. The proposed drawing correction and/or the proposed substitute sheets of drawings, filed on 04/20/2001 have been approved by the examiner.

5. The formal drawings filed on 07/09/2001 are acceptable.

Priority

6. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

7. The Information Disclosure Statement filed on 04/20/2001 has been considered.

Specification

8. The disclosure is objected to because of the following informalities: On page 5, line 10, reference number "2" should read "2b".

9. The disclosure is objected to because of the following informalities: The disclosure recites a buffer region being formed deeper than a body region and having a larger thickness than the body region. However, on page 6, table 1, the buffer region is described to have a thickness of about 0.15 to 0.45 micrometers, and the body region is described to have a thickness of about 0.25 to 0.75 micrometers That is, the body region seems to be formed deeper than the buffer region and having a larger thickness than the buffer region.

Appropriate correction is required.

Claim Rejections - 35 USC § 102/103

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

12. Claims 5 and 12 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Lidow et al. (5,742,087). Regarding claim 5, Lidow et al. teach in figure 8 and related text (column 6, lines 7-47) lateral diffused metal oxide semiconductor (LDMOS) integrated device comprising: a semiconductor substrate 83; a drain region 87 of a first conductivity type n- adjacent the semiconductor substrate and comprising a superficial buffer region 86 being more heavily doped n+ than adjacent portions of the drain region; a body region 89 (the portion of region 89 which is located just below gate 80, adjacent to buffer region 86) in the buffer region and having a second conductivity type p+; and a source region (the

n+ region which is located below source electrode 81) in the body region 89 and having the first conductivity type n+.

Lidow et al. do not explicitly state in the embodiment of figure 8 that the body region is formed in the buffer region.

Lidow et al. teach in the embodiment of figure 2 body region p+ 30 formed in buffer region n+ 40. The processing steps of forming the device of figure 2 are depicted in figures 3-6 (column 5, lines 7-8). Lidow et al. first form buffer regions n+ 63, 64 (figure 4), and then form body regions p+ 71, 72 in buffer regions 63, 64 (figure 5). Lidow et al. further teach that figure 8 is a planar configuration of the disclosed invention. Therefore, it is highly probable that body region p+ of figure 8 is also formed after forming buffer region 86, such that body region p+ is formed in buffer region n+ 86. In fact, close examination of figure 8 reveals that the top portion of buffer region n+ 86 is wider than the round shape of the lower part of body region p+ 89. This means that the round part of body region p+ is formed in buffer region n+ 86, as claimed.

In the alternative, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to first form the buffer region and then the body region such that the body region is formed in the buffer region, as taught by figure 2 of Lidow et al., in the embodiment of figure 8 of Lidow et al.'s device, in order to simplify the processing steps of making the device. The combination is motivated by the teachings of Lidow et al. who teach in figure 2 a body region formed in the buffer region.

Regarding claim 12, Lidow et al. teach a drain region 87 doped with phosphorous (column 5, lines 23-25); and wherein the body region 89 is doped with boron (column 5, lines 42-43).

Claim Rejections - 35 USC § 103

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

14. Claims 6-11 and 14-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lidow et al.

Regarding claims 7, 9 and 14, Lidow et al. teach substantially the entire claimed structure, as applied to claim 5 above, except a superficial buffer region having a dopant concentration of about 5E16 to 5E17 atoms cm(-3) and the adjacent portions of the drain region having a dopant concentration of about 2.5E15 to 2.5E16 atoms cm(-3). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to form a superficial buffer region having a dopant concentration of about 5E16 to 5E17 atoms cm(-3) and the adjacent portions of the drain region having a dopant concentration of about 2.5E15 to 2.5E16 atoms cm(-3), in Lidow et al.'s

device, because it well within the skills of an artisan to adjust the relative concentrations of the superficial buffer region and the drain region in order to optimize the device characteristics. Note that differences in concentration do not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller , 220 F.2d 454, 105 USPQ 233, 235 (CCPA 1955). See also In re Hoeschele , 406 F.2d 1403, 160 USPQ 809 (CCPA 1969). For more recent cases applying this principle, see Merck & Co. Inc . v. Biocraft Laboratories Inc. , 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied , 493 U.S. 975 (1989), and In re Kulling , 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990).

Regarding claims 6 and 15, Lidow et al. teach substantially the entire claimed structure, as respectively applied to claims 5 and 14 above, except a drain region having a depth of about 1.5 to 4.5 micrometers. Lidow et al. teach a drain region having a depth of about 8 micrometers (column 2, lines 23-25). Lidow et al. further teach that the drain region can have other depths depending on the desired reverse voltage (column 2, lines 25-29). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a drain region having a depth of about 1.5 to 4.5

micrometers, in Lidow et al.'s device, in order to use the device in an application which requires a specific reverse voltage characteristics.

Regarding claims 8 and 16, Lidow et al. teach substantially the entire claimed structure, as respectively applied to claims 5 and 14 above, except a superficial buffer region having a depth of about 0.15 to 0.45 micrometers. Lidow et al. teach a superficial buffer region having a depth of about 3 micrometers (column 2, lines 30-31). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a superficial buffer region having a depth of about 1.5 to 4.5 micrometers, in Lidow et al.'s device, in order to adjust the ON resistance such that optimum characteristics of the device can be obtained, and in order to use the device in an application which requires certain switching speed.

Regarding claims 10 and 17, Lidow et al. teach substantially the entire claimed structure, as respectively applied to claims 5 and 14 above, except a body region having a depth of about 0.25 to 0.75 micrometers. Lidow et al. teach a body region having a depth of about 3 to 4 micrometers (column 4, lines 15-18). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a body region having a depth of about 1.5 to 4.5 micrometers, in Lidow et al.'s device,

because it well within the skills of an artisan to adjust the relative thicknesses of the device's regions in order to optimize the device characteristics.

Regarding claims 11 and 18, Lidow et al. teach substantially the entire claimed structure, as respectively applied to claims 5 and 14 above, except a body region having a dopant concentration of about 5E17 to 5E18 atoms cm(-3). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to form a body region having a dopant concentration of about 5E17 to 5E18 atoms cm(-3), in Lidow et al.'s device, because it well within the skills of an artisan to adjust the relative concentration of the body region in order to optimize the device characteristics. Note that differences in concentration do not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller , 220 F.2d 454, 105 USPQ 233, 235 (CCPA 1955). See also In re Hoeschele , 406 F.2d 1403, 160 USPQ 809 (CCPA 1969). For more recent cases applying this principle, see Merck & Co. Inc . v. Biocraft Laboratories Inc. , 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied , 493 U.S. 975 (1989), and In re Kulling , 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990).

15. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lidow et al. in view of Contiero et al. (5,041,895).

Regarding claim 13, Lidow et al. teach substantially the entire claimed structure, as applied to claim 5 above, except a drain region doped with boron and a body region doped with phosphorus. That is, Lidow et al. do not reversing the polarity of the transistor.

Contiero et al. teach in figure 1 a complementary LDMOS (i.e. n-channel and p-channel LDMOS transistors). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to dope the drain region with boron and the body region with phosphorus, in Lidow et al.'s device, in order to use the device in an application which requires a complementary LDMOS device.

Conclusion

16. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Reference N is cited as being related to LDMOS.

Papers related to this application may be submitted to Technology center (TC) 2800 by facsimile transmission. Papers should be faxed to TC 2800 via the TC 2800 Fax center located in Crystal Plaza 4, room 4-C23. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (November 15, 1989). The Group 2811 Fax Center number is (703) 308-7722 and 308-7724. The Group 2811 Fax Center is to be used only for papers related to Group 2811 applications.

Any inquiry concerning this communication or any earlier communication from the Examiner should be directed to *Examiner Nadav* whose telephone number is **(703) 308-8138**. The Examiner is in the Office generally between the hours of 7 AM to 4 PM (Eastern Standard Time) Monday through Friday. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas, can be reached at **(703) 308-2772.**

Any inquiry of a general nature or relating to the status of this application should be directed to the **Technology Center Receptionists** whose telephone number is **308-0956**

Ori Nadav

August 16, 2002